This study explores the interests served by technological reform through an empirical analysis of power shifts stemming from the use of computer technology in American local governments. Alternative hypotheses concerning the existence and direction of power shifts are tested with survey and observational data collected in 42 U.S. cities. The findings indicate that computer-based systems tend to follow and reinforce the existing pattern of local government power relationships, whether that pattern be pluralistic or centralized in bureaucrats, technocrats, or politicians. Consequently, computing tends to support the interests of the status quo versus the interests of reform.

THE INTERESTS SERVED BY TECHNOLOGICAL REFORM
The Case of Computing

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Administrative reformers have always wanted to make government more businesslike by strengthening the professional management of government agencies (Banfield and Wilson, 1966). At the local level, the early reformers initiated structural reforms such as master planning, council-manager government, nonpartisan ballots, and at-large elections. At the state and national levels, they initiated the merit

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system, the executive budget, and the appointment versus election of department heads. Structural reform still emerges in contemporary mechanisms such as regional agencies for area-wide planning and coordination and mini-city halls for the decentralization of service delivery. Whereas the early reformers focused upon structural change as the primary means of implementing their goals, contemporary reformers increasingly turn toward technological change.[1] Thus, many governments have turned to the adoption and use of new technologies coincident with rapid advancements in the application of management science, computing, telecommunications, and other administrative technologies in the private sector.

This trend is reflected in the widespread diffusion of computer technology in the government sector.[2] Computer technology might further the business goals of economy and efficiency through technical payoffs in the processing of information. Consequently, the success of computer processing of information might be evaluated as a reform mechanism by its impacts on saving money, staff, and other governmental resources. However, *the functions of technological reform may be political as well as technical.* Those who control technological reforms may shape the design and use of technology to serve their interests over the interests of others (Dutton and Kraemer, 1977). In doing so, political goals can supplant the business goals of economy and efficiency. Therefore, if one is to evaluate computer technology as a reform mechanism, one must first explore the interests served by the technology.

This paper investigates the interests served by computing as a technological reform. Specifically, it is about the power shifts which result from governmental computer use and the interests served by these power shifts. There are five hypotheses about the direction of power shifts which are empirically examined using survey and case study data on American cities.

COMPUTERS AND POWER SHIFTS

There is considerable debate in the literature over both the existence and direction of power shifts and, therefore, whose interests are served by computing. On the one hand, some suggest that computing is apolitical in that it does not result in power shifts (Kling, 1974; Westin, 1972a). Computer-based information is claimed to be unsophisticated, of low quality, often conflicting, one of many sources of information, easily ignored by decision makers, often irrelevant, and, even if relevant to decisions, leaves great room for interpretation. In sum, decision makers would seldom develop or change their position on the basis of computer printouts.

On the other hand, information is viewed as a political resource within organizations much like status or positional authority and is closely akin to expertise. Because computers can change the character of information flows within organizations—including the speed, direction, content, and pattern of circulation—computers might influence the relative decisional effectiveness of different actors and therefore the relative influence of different interests in the governmental system.[3] Furthermore, those who control the technology might affect how the technology is utilized such as to enhance their decision-making effectiveness and interests within the organization.[4] That is, computing is likely to entail certain power payoffs or "power shifts." These power shifts are "gains in one person's decision-making effectiveness made at the expense of another person's. They are redistributions of the benefits of decision making" (Downs, 1967: 205). Among the most prominent expectations about the interest served by computing are the bureaucratic, technocratic, old-style, and pluralistic hypotheses.

BUREAUCRATIC POLITICS

A prevailing hypothesis is that computing is a tool of the administrative reform movement, is controlled by the profes-

sional bureaucrats through central administrative structures, and is used to improve their ability to manage subordinates and marshal information which supports their recommendations to top elected officials (Dutton and Kraemer, 1977; Ghere, 1978; Laudon, 1974; Downs, 1967). Computing serves the administrative reform movement by strengthening the role of the benefits of decision making" (Downs, 1967: 205). lower level staff within the organization, and the general public. In local governments, the bureaucratic politics hypothesis suggests that computing tends to shift power to top managers (e.g., to the city manager in council-manager cities and to one or two department heads who informally serve the top management function in strong-mayor cities).[5]

TECHNOCRATIC POLITICS

Another common expectation is that computing, like most high technology, will be controlled by technical people (Danziger, 1977; Bell, 1973; Downs, 1967; Ellul, 1964).[6] Experts with specialized skills in the use of computing—technocrats—will control the design, development, and use of the technology for only they understand its operation, potential, and limits. Thus, computing will tend to serve their interests in the maintenance and enhancement of the technocrat's role in organizational decisions. In local governments, the technocratic politics hypothesis suggests that computing tends to shift more power to the "new urban planners," the modern counterpart of Taylor's "new class of urban managers" trained in the techniques of scientific management. In contrast to the traditional planner skilled in zoning and land use planning, the new urban planner is skilled in the use of computer-based analytical tools such as statistical analysis, urban modeling, and simulation. Often such planners are located in the research division of local planning departments, but they are also found in urban renewal, community development, and community analysis agencies.

OLD-STYLE POLITICS

Another expectation is that computing is a political technology which is largely controlled by and serves the elected officials through improving their capabilities to use and control information (Chartrand, 1967; Pool et al., 1964). In local governments, the old-style politics hypothesis suggests that computing tends to shift more power to the elected mayor and council who control computing through their legitimate and formal control over the organization. At the broadest level, public officials want to be reelected or advance to higher office and, therefore, might seek to use computing to advance these political ambitions. Depending on the official's election strategy, control over a government's computer-based information systems might be used to build public support indirectly, through improving the quality of governmental services, monitoring the bureaucracy, and cutting costs. Or, the politician might seek to use computing to build public support directly, through its use as a campaign tool for direct mailings, analysis of voting patterns, or data support justifying the official's decision to the public.

PLURALISTIC POLITICS

A prominent rival hypothesis is that no single interest controls computer technology. Rather, a pluralistic array of interests—bureaucrats, technicians, and politicians—participates in the variety of governmental decisions which shape the adoption and use of computing (Pettigrew, 1975, 1973; Cyert and March, 1963). While a technological elite might tend to dominate many individual computing decisions, their influence is mediated by the numerous groups and interests which place demands on computing service providers and is further constrained by the bureaucratic politics of the government which sets the decision rules for the individual choices. In local governments, the pluralistic politics hypoth-

esis suggests that computing will benefit elected officials, managers, and planners who all influence computing decisions.

REINFORCEMENT POLITICS

A final expectation is that control over computing will vary across organizations. Those who control the technology will shape it to serve their interests. However because control over computer technology varies across organizations, computing does not systematically shift power to a particular kind of official. That is, *computer-based systems tend to follow and reinforce the existing pattern of power relationships, whether that pattern be pluralistic or centralized in bureaucrats, technocrats, or politicians.* Computing tends to be used or not used to the degree that it supports the position or interests of those who control the governmental organization. Computing reallocates power or influence only in the sense that it accentuates existing inequalities of influence. Computing seldom shifts power away from those who control governmental decision making (Hoffman, 1977, 1975, 1973). While the traditional hypotheses emphasize the impact of a technology on the organization which adopts it, *the reinforcement hypothesis emphasizes the impact of an organization on the technology which it adopts.*[7] The interests served by computing are likely to be the same interests served by the organization which has adopted the technology because computing simply enhances and extends the organization's capability of serving the interests of those who control the organization. In local governments, this hypothesis suggests that computing will increase the decision-making effectiveness of managers in reform governments, mayors in strong-mayor governments, and departments and planners in governments with departmental autonomy.

METHODS AND DATA

Our strategy for empirically assessing the power shift hypothesis is to focus on those kinds of computer-based information systems which are most likely to affect the power relationships among organizational elites within a specific class of organizations—American cities.

While nearly any use of computer-based information can be viewed as increasing the decisional effectiveness of some official or agency in the government,[8] those systems which are most likely to affect the balance of power among bureaucrats, technicians, and politicans are those which better enable any of these officials to:

(1) *manage*—control near term events by getting rapid and correct feedback about ongoing operations
(2) *plan*—anticipate future uncontrollable events by getting analyses of current trend and predictions of future events
(3) *persuade or coerce*—control decision situations by getting superior or sensitive information which is perceived as compelling.

Systems which serve these purposes can be distinguished by whether they are primarily oriented toward data about the urban environment or about the internal operations of the government. Table 1 arrays various illustrative systems which are likely to affect the decisional effectiveness of bureaucrats, technicians, and politicians by purpose (management, planning, and politics) and by the kind of data which supports their use (data banks versus operational systems).

Data banks pool facts about people and their environment (e.g., a jurisdiction's demography and its economy). In turn, this new information is aggregated and analyzed to determine environmental conditions (e.g., social indicators of the welfare of citizens and the health of the economy). These analyses can be used as a guide to public officials in identifying problems, determining needs, developing programmatic remedies, and applying for outside assistance. In some instances, in-

TABLE 1

A Typology of Computer-Based Urban Data Systems, Likely to Affect the Decisional Effectiveness of Bureaucrats, Technicians, and Politicians

PURPOSE	KIND OF SYSTEM	
	DATA BANKS (Contain data about the population/ clientele and their environment)	OPERATIONAL SYSTEMS (Contain data about government personnel and operating departments)
MANAGEMENT	Intergovernmental reporting Uses Completing grant applications, preparing proposals, meeting intergovernmental reporting requirements. Ex U.S. Census of population, housing survey, land use inventory	Governmental reporting: Uses Monitoring the activities of individuals and the operations of departments, monitoring revenues and expenditures, equipment and supplies. Ex Budget monitoring systems, inventory control systems, activity reporting systems, accounting systems.
PLANNING	Environmental analysis Uses Analyzing socio-economic characteristics of populations, geographic areas, and political districts, forecasting demand. Ex Population, land use, traffic and economic inventory systems, urban development models, fiscal impact models	Governmental analysis Uses Allocating resources and manpower, scheduling activities, forecasting revenues & expenditures, forecasting cash flows, optimizing routes Ex Manpower allocation models; emergency vehicle dispatch models; routing models, revenue and expenditure forecasting models.
POLITICS	Client persuasion Uses Legitimation of policy positions to clients, political assessment of development plans; analysis of political constituency; analysis of distribution of costs and benefits of government services. Ex Social indicator systems, planning models and analyses (above), political analyses.	Client and intragovernmental persuasion: Uses. Handle client requests and complaints, document policy positions Ex Complaint monitoring systems, collective bargaining models, performance analyses

formation also is being fed into simulation and other models which mimic the behavior of some aspect of the environment (e.g., population growth and economic development). These analyses and models can be used to pretest the effects of various public actions as a guide to public officials in deciding among alternative policies. And, information about people (their demographic characteristics, likes and dislikes, and such) can be used to assess the political feasibility of development and financial plans.[9] As these examples illustrate, such data banks serve management, planning, and political purposes.

Operational systems are the functionally oriented computer systems which serve the internal operations of the government and which contain data about government employees and

departmental operations. This information is variously aggregated and analyzed to determine revenue and expenditure patterns, personnel vacancies, turnover, vacations or sick leave, individual and departmental workloads, and selected indicators of performance. These analyses can be used by public officials in monitoring expenditures, identifying personnel problems, determining work assignments, and scheduling or rearranging departmental operations to improve performance. Sometimes information is fed into computer models which imitates some operation of a department such as handling emergency calls, dispatching vehicles, assigning personnel, or predicting cash flow. These analyses and models can be used to predict the effects of various departmental actions as a guide to public officials in deciding among alternative operational priorities and procedures. Also, individual and aggregated data from the operational systems can be used in support of particular policy positions, personnel actions, collective bargaining negotiations, or citizen requests and complaints. Consequently, operational data systems can serve management, planning, and political purposes similar to their data bank counterparts.

Given the different types of computer-based information systems in government and the different purposes they serve, our research strategy is first to empirically describe the use of data banks and operational systems by each type of decision maker for management, planning, and political purposes. This enables us to address the patterns of computer utilization characteristic of bureaucrats (city managers and administrators), technicians (new urban planners), and politicians (elected mayors and councils). These patterns of computer utilization allow us to speculate about the likely magnitude and direction of power shifts, for the use of computing seems to be a necessary if not sufficient condition for power shifts to occur. Second, we more directly explore the magnitude and direction of power shifts through an analysis of systematically coded case study observations regarding those officials

whose influence was affected by the use of computing in 42 cities.

THE SAMPLE

This study is based on data collected in 1976 in 42 U.S. cities over 50,000 in population. The cities were selected by a stratified sampling procedure such that all cities were automated and that the cities vary in the sophistication, extensiveness, and organizational arrangements of computing.[10] Thus, the average sample city is somewhat more automated than the typical U.S. city over 50,000; and the computing environments of these cities have somewhat more variation than would be the case for a random sample of automated cities.

THE DATA

Within each city, data were collected using self-administered questionnaires, field-coded questionnaires, and case studies of the use of computing by top managers, mayors, councils, and planners. A pretested self-administered questionnaire was completed by the manager and several of the manager's staff, the mayor and several staff, a sample of council and staff, and those people responsible for maintaining and analyzing computer-based urban data banks and operational data—the planners and analysts.[11]

In addition to the self-administered questionnaires, the field work involved six investigators, including the authors, in case studies of each city for an average of three person-weeks in each of at least eight cities. Each site visit provided rich case study material as well as systematic judgmental ratings based on these case studies. This was accomplished by a series of structured questionnaires which were completed by the investigators during each site visit based on their case work, interviews, and archival research on each site. These

questionnaires recorded their observations by a series of predetermined questions and response categories. This paper relies most heavily on these field-coded instruments as empirical data on the way in which computing is used by local government officials.

LIMITATIONS

There are several important limitations to our analysis. First, this study is based on a limited group of U.S. cities, namely those with at least a moderate level of automation. Second, the concept of power shifts is controversial and its measurement is complex. Our study accepts a single definition of power shifts and is limited to systematic field observations and interviews at one point in time to explore a phenomenon which occurs over time. But, because power shifts raise important issues for the evaluation of technological reform, we have attempted to assess power shifts from computing by systematically integrating survey and case study methodology. We hope that other researchers will investigate similar issues in other settings and with other approaches and operational measures of power shifts. Third, this research does not deal with the interorganizational interests which may be served by computing. This study is focused on the intraorganizational, bureaucratic politics of computing and is only suggestive of the impact of computing on the relative influence of local governments vis-à-vis either the general public or other organizations.

FINDINGS

DO POWER SHIFTS OCCUR?

The frequency and magnitude of power shifts are likely to depend on the degree and kind of use made of computers by bureaucrats, technocrats, and politicians. In order to describe the use of urban data banks and operational systems,

we inquired about whether or not each kind of public official used either data banks, in each of six tasks displayed in Table 2, or operational systems, in each of four tasks displayed in Table 3. We then asked for examples and evidence of this use. The responses were used to categorize each official by whether computing was *not used*, *used only in exceptional cases*, or *generally used* (not just in isolated or nonspecific cases) for each task.

Use of Data Banks

The patterns of data bank use suggest that power shifts are likely to occur but the magnitude of power shifts is likely to be less than predicted in much of the literature (Table 2). First, while each kind of official tends to use data banks, the overall use of data banks is low. In only about 10% of the cities does any given kind of public official *generally* use data banks. In about half the cities, the officials use data banks only in exceptional cases. For only two tasks, problem finding and problem legitimation, does any kind of official tend to generally use data banks in over 10% of the cities.

Second, there are more similarities than differences in use by role.[12] Planners are the major users of data banks given that their median level of use is highest on five of the six tasks. The planners are followed by the managers, mayors, and council, respectively. But, the total difference among roles on any task is less than 20% and most frequently is about 10%. This small difference in use among officials is unexpected given the predictions in much of the power shift literature.

Third, each kind of official tends to use data banks in somewhat different ways. Other data indicate that planners focus on planning and political purposes.[13] Table 2 further indicates that while managers are more likely to use data banks for planning purposes (problem finding, decision making, and policy development), they are about as likely as are the elected officials to use data banks for political purposes

TABLE 2
Levels of Use of Urban Data Banks by Type of Official

Kind of Uses	Level of Use	Level of Use by: Manager	Mayor	Council	Planners/ Analysts
PLANNING					
Problem finding--lead to new or clear perceptions of community problems	(1) Not used[a]	27%	40	41	18
	(2) Exceptional use	63%	49	46	60
	(3) Generally used	10%	11	13	22
	Median[b]	1.87	1.69	1.69	2.04
Changed or affected decisions	(1) Not used	57%	72	67	57
	(2) Exceptional use	43%	25	33	38
	(3) Generally used	0%	3	0	5
	Median	1.38	1.19	1.25	1.37
Policy development	(1) Not used	21%	41	40	21
	(2) Exceptional use	4%	0	0	3
	(3) Generally used	75%	59	60	76
	Median	2.83	2.30	2.32	2.84
POLITICS					
Legitimize existing problems	(1) Not used	40%	33	36	26
	(2) Exceptional use	43%	33	51	38
	(3) Generally used	17%	33	13	36
	Median	1.73	1.00	1.78	2.13
Gain publicity	(1) Not used	40%	47	54	38
	(2) Exceptional use	50%	50	38	50
	(3) Generally used	10%	3	8	12
	Median	1.70	1.56	1.43	1.75
Determine the political acceptability of actions	(1) Not used	76%	78	77	73
	(2) Exceptional use	17%	22	18	22
	(3) Generally used	7%	0	5	5
	Median	1.15	1.14	1.15	1.19

a. Percentage of cities where one or more data banks are automated, but not used in this way by role type.
b. Scored: 1 = not used; 2 = exceptional use; 3 = generally used.

(legitimizing their position, gaining publicity, and determining the political feasibility of different actions). Thus, while there is some specialization among roles in the purposes for which they use computing, no kind of official seems to have a monopoly over the use of computing in a specific area.

Use of Operational Systems

The relatively low use of urban data banks by public officials might be due to the fact that data banks play a minor role in urban decision making when compared to operational data systems. Operational data systems *are* used more extensively than urban data banks, but overall use remains moderate (Table 3). In more than three-fourths of the cities, operational systems are used for management, planning, and political purposes. Also, there are somewhat greater differences in use by role. The managers' use of operational systems clearly dominates when compared to the use made by elected officials. In about one-half of the cities, the managers make general use of operational data systems for monitoring subunits, making decisions, and documenting policy positions. The only use which ranks low for the managers is responding to citizen complaints. In contrast, mayors most often use operational data for documenting policy positions and monitoring subunits. Thus, our general implication remains the same. Power shifts are quite possible, but not dramatic in their intensity.

WHO GAINS AND LOSES?

The direction of power shifts is also likely to be sensitive to the degree and kind of use made of computers by bureaucrats, technocrats, and politicians. The relative frequency with which each kind of official tends to use computing implies a loose hierarchy of officials who are more likely to gain in decision-making effectiveness (Tables 2 and 3). Planners tend to dominate the use of data banks; managers tend to dominate the use of operational data systems. This suggests that managers and planners generally gain somewhat more decision-making effectiveness than elected mayors or councils. However, the often small differences among officials in their frequency of use is suggestive of patterns expected by the pluralist interpretation.

TABLE 3
Levels of Use of Operational Data Systems by Type of Official

Kind of Uses	Level of Use	Level of Use by: Manager	Mayor	Council
MANAGEMENT				
Monitor and control departments and agencies	(1) Not used[a]	18%	20	24
	(2) Exceptional use	33%	63	61
	(3) General use	49%	17	15
	Median[b]	2.44	1.97	1.93
PLANNING				
Changed or affected decisions	(1) Not used	18%	38	46
	(2) Exceptional use	32%	34	27
	(3) General use	50%	28	27
	Median	2.50	1.85	1.67
POLITICS				
Respond to citizen requests and complaints	(1) Not used	35%	55	59
	(2) Exceptional use	38%	19	22
	(3) General use	27%	26	19
	Median	1.90	1.41	1.34
Document policy positions	(1) Not used	26%	28	47
	(2) Exceptional use	30%	36	36
	(3) General use	44%	36	17
	Median	2.31	2.09	1.58

a. Percentage of cities where operational data is automated, but not used by role type.
b. Scored: 1 = not used in this way, 2 = exceptional use, 3 = general use.

Patterns of Use

This loose hierarchy of officials with relatively greater and lesser gain from computing is based upon the percentage of cities in which a particular official rated high or low in the use of computing. It might be that in cities where the manager gains, the mayor and council does not, and vice versa. In other words, the data could still support extensive power shifts if we find a tendency for high levels of use by one subset of officials. *But, as shown in Table 4, this is not a pattern of data bank or operational system utilization.*

Cities where one kind of official tends to have a high level of use, either of data banks or operational systems, are cities

TABLE 4
Relationships Among Indicators of the Use of Computer-Based Operational and Data Bank Information by Role Types

Indicators	Manager Use	Mayor Use	Council Use	Planner/ Analyst Use
		OPERATIONAL DATA		
Manager Use		.35[b]	.34[b]	-
Mayor Use	.51[b]		.43[b]	-
Council Use	.46[b]	.60[b]		-
Planner/Analyst Use	.41[b]	.60[b]	.46[b]	
	DATA BANKS			

a. Pearson correlations among role types for use of operational data is presented in upper right and correlations for data banks is presented in lower left.
b. $p < .05$

where all other kinds of officials will tend to have a high level of use. Rather than cities being distinguished by different kinds of officials dominating the use of computing, *cities are largely distinguished by those with and those without a high use of computing by planners, bureaucrats, and politicians.* Thus, the simple frequencies presented above do not mask more differentiated patterns of utilization. This finding tends to cast further doubt on the bureaucratic, technocratic, and old-style politics hypotheses and tends to add support to the pluralistic hypothesis.

The Frequency of Power Shifts

While the frequency of utilization is suggestive of power shifts, a more direct measurement is available in the form of judgmental ratings made on the basis of extensive case study observations within each site. Table 5 shows the degree to which each type of public official was judged to gain and

lose influence as a result of computing in local government. These ratings further support the existence of power shifts and the same loose hierarchy of gainers described above. Computing is judged to have had *some effect* on the relative influence of at least one official in about 80% of the cities. Where there is an effect, computing has tended to increase rather than decrease the influence of public officials. While computing has decreased the influence of at least some officials in 27% of the cities, it has increased the influence of some officials in 54% of the cities. By rank, those who tend to gain (and not lose) influence are the planners (the technicians), the top managers and department heads (the bureaucrats), and the mayor and council (the politicians).

However, these rankings are less pronounced than either the technocratic or bureaucratic formulation of the power shift hypothesis suggests. Planners are not great beneficiaries of computing for they tend to gain influence in only about 27% of the cities. Likewise, managers have gained influence in only about 27% of the cities, while department heads and mayors gained influence in nearly as many, 18% and 19% respectively. Only the councils generally tend to have lost influence (in 20% of the cities) as a result of computing more often than they have gained influence (in 5% of the cities). Thus, no single official appears to be a general, substantial, and sole beneficiary of power shifts from computing in cities. The shifts that occur are mainly gains rather than losses in the influence of officials, and the gains appear to be shared among nearly all officials. These findings, therefore, add support to the pluralist interpretation.

Patterns of Power Shifts

While the marginals reported in Table 5 are supportive of the pluralist hypothesis, they are susceptible to a common problem with the aggregation of cross-sectional data. The same marginals could result from pluralistic patterns characterizing some subset of cities or the operation of different

TABLE 5
Percentage of Cities Where the Use of Computer-Based Data Shifted Influence Among Officials

Official Affected	Effect on Official		
	Decreased Influence	No Effect	Increased Influence
Data Bank Custodians and Planners	0	68	32
Manager, CAO and Staff	3	70	27
Departments	10	72	18
Mayor and Staff	14	67	19
Council and Staff	20	75	5
Any of the above officials	27	19	54

a. Based on interviews at one-point-in-time, investigators developed a case history of the use of computing and its impacts on power shifts in each city. Each kind of official in each city was then scored as having had their influence decreased, unaffected, or increased as a result of computing. Disagreements between investigators (normally two per city) were resolved by reexamining the case histories.

models of power shifts in different cities. Thus, it is important to evaluate the pluralist interpretation by testing whether it is the case that power gains on the part of one official are positively associated with power gains on the part of other officials—as would be the case for the pluralist model.

Surprisingly, in contrast to patterns of computer utilization, the patterns of power shifts are opposite the expectations of the pluralist hypothesis (Table 6). Power gains of one official are not positively associated with gains of other officials. Instead, there is a great deal of independence. Apparently, different models of power shifts operate in different cities, rather than pluralistic patterns being characteristic of a subset of cities in which power shifts are relevant.

Power Reinforcement from Computer Use

The reinforcement politics hypothesis provides a plausible explanation for why the nature of power shifts might vary

TABLE 6
Relationships Among Power Shift Ratings for Different Officials

Power Shifts to:	Manager	Mayor	Council	Planner/ Analyst	Departments
	Pearson Correlations				
Manager		.05	.10	-.13	-.19
Mayor	27		.04	.36	-.19
Council	30	37		-.23	-.06
Planner Analyst	30	37	40		.21
Departments	30	37	40	40	
	Sample size				

a. Pearson correlations are presented in upper right and sample sizes are presented in the lower left.

across cities. It may be that computing tends to reinforce the influence of those officials in control rather than to shift influence to a particular type of official. Because the influence structures of local governments vary, so might the nature of power shifts. In order to test the reinforcement hypothesis, we next explore the relationship between the structure of influence within a city and power shifts. If the reinforcement hypothesis is valid, then those in control should gain and certainly not lose power as a result of computing.

Table 7 describes the relationship between power shifts and several independent variables that tend to reflect the influence structures of local governments. Generally, power shifts tend to accentuate the existing structure of influence within the city, thereby supporting the reinforcement hypothesis (Table 7). In strong-mayor cities, computing tends to shift greater influence to the mayor, while in council manager cities, computing tends to shift greater influence to the manager. In larger cities with more complex and decentralized influence structures, computing tends to shift power away from the top manager and toward the planners and the operating departments, which already are likely to enjoy more autonomy than their counterparts in smaller cities. And where

TABLE 7
Pearson Correlations Between Selected Independent Variables and Power Shifts to Managers, Mayors, Councils, Planner Analysts and Departments

	Power Shifts to:[a]				
Independent Variables	Manager	Mayor	Council	Planner Analyst	Departments
STRUCTURE					
Strong mayor city	-.22	.38	-.03	.12	-.13
Council manager city	.22	-.37	.09	-.23	.05
SIZE & COMPLEXITY					
Total population	-.31	-.03	-.20	.39	.41
Government expenditures	-.26	-.15	.03	.29	.46
CONTROL					
Top manager influence[b]	-.21	.25	-.24	.04	-.29
Mayor influence[b]	-.49	.10	-.16	.04	-.12
Council influence[b]	-.34	-.04	-.16	-.12	-.03
Department head influence[b]	-.11	-.32	-.19	-.16	.20

a. Marginals for these dependent variables are presented in Table 5.
b. Two or more informants in each city were asked "Consider a decision related to data processing, such as introducing computers to help perform a task. How often has each of the following officials had a major input into the final decision?"

mayors and councils are influential in computing decisions, managers are less likely to gain power as a result of computing.

SUMMARY AND DISCUSSION

Given the diversity of opinion regarding both the existence and direction of power shifts, we have examined the use of urban data banks and operational data systems as well as the power shifts to which they can be linked. From this examination, we can review the findings concerning the magnitude of power shifts and draw some conclusions as to the explanatory power of the five hypotheses regarding the direction

of power shifts. We will then turn to the interests which are likely to be served as a result of these power shifts.

Power shifts occur in most automated local governments but these shifts tend to be subtle, limited, and complex in their patterns. While power shifts were judged to occur in over 75% of the cities investigated, the generally low to moderate use of computing for management, planning, or politics tends to limit the relevance of computing to the power relationships among bureaucrats, technocrats, and politicians. Across all governments, the relative decision-making effectiveness of no single kind of official is overwhelmingly enhanced by computer use.

The bureaucratic politics hypothesis suggests that managers will be major beneficiaries of power shifts. We did find that managers are the most frequent users of operational data systems and that managers were judged to have gained some influence in about one-fourth of the cities. However, managers are not the most frequent users of data banks and are not the most frequent beneficiary of power shifts. While managers are somewhat more likely to gain as a result of computing in the smaller city manager cities, they are not the dominant beneficiary in general. Consequently, the bureaucratic politics hypothesis is not descriptive of our findings.

The technocratic politics hypothesis suggests that the new urban planners will be the major beneficiaries of power shifts. We did find that planners both use data banks more than other officials for nearly every use investigated and are the most likely beneficiaries of power shifts. However, they have far from a monopoly over the use of data banks, are nearly irrelevant to the use of operational systems, and tend to gain influence in only about a third of the cities investigated. Furthermore, where planners tend to gain, so do mayors and other operating departments, generally in the larger cities. Thus, while the technocratic politics hypothesis predicts the relative dominance of the planners, it fails to explain the overall pattern of power shifts which include many shifts in favor of other officials.

The old-style politics hypothesis suggests that elected officials will be the major beneficiaries of power shifts. This is not supported. While mayors and councils use computing and sometimes appear to gain influence as a consequence, they least often gain and most often lose influence relative to planners and bureaucrats.

The pluralist hypothesis suggests that no single kind of official predominantly gains in decision-making effectiveness. This hypothesis finds substantial support in that each kind of official uses computer-based data and all appear to occasionally gain influence as a result. Further support is provided by the fact that where one kind of official tends to use computer-based data, so do the other kinds of officials. However, the patterns of power shifts are inconsistent with the pluralist hypothesis and suggest the operation of different power shifts in different cities.

Finally, the reinforcement politics hypothesis suggests that computer-based systems tend to follow and reinforce the existing pattern of power relationships. This hypothesis is most consistent with all survey findings and explains why we find the nature of power shifts to vary across governments. Each model of power shifts—the bureaucratic, technocratic, old-style, and pluralist—might be found to operate in some cities, depending on the existing structure of influence.

Thus, *planners and managers tend to be relative gainers because of the existing structure of influence in local governments.* In many cities the planning function is taking on a greater role with the increased importance of federal grants, needs assessment, evaluation components of programs, and more stringent reporting requirements. In the large cities, these factors come to play within an organizational setting which is more decentralized. Within such a system, planners have some autonomy and gain relatively more influence than they might otherwise have without the computing resource.

Likewise, managers clearly gain in influence in relation to their subordinates by the use of computing to monitor and control departmental operations. Yet, computing does not

tend to shift greater influence to the manager in those cities where departments and agencies have a great deal of political autonomy from the manager—that is, in the large, strong-mayor cities. In contrast, computing tends to reinforce the power of the manager in the smaller city manager cities in which the mayor and council are less active and influential.

WHOSE INTERESTS ARE SERVED?

The local government reform movement sought to make local government more efficient and rational through a series of structural and technological reforms. However, computing as an administrative reform has not had a large role in increasing the influence of professional managers in the operation of local government. Rather, those who control local government decisions have adapted this technology to serve the existing social and political structures. Thus, computing is a *malleable technology*. It can be shaped to serve the interests of administrative reform to the degree that administrative reformers control the operations of local government. Where they do not, computing is likely to serve other interests.

Computing can be viewed as a malleable but certainly not an apolitical technology to the degree that it serves those interests which control its design and use. It is a means, a tool, for accomplishing the ends of those who use it. However, its impacts are not neutral. Given the current patterns of control over computing and use of the technology, computing as now implemented tends to serve some interests more than others. Most generally, computing supports the status quo of most local governments.[14] Specifically, urban data systems have been shaped to serve the interests of the planners, top managers, and department managers over elected officials. In large part, this bias of computing is a reflection of the success of the structural reform of local government. It may be that reformers have been successful in raising the influence of technocrats and bureaucrats in the operations of local

government to the point that they can shape organizational change and innovation to further enhance their influence.

NOTES

1. Danziger and Dutton (1977) indicate that reform structures promote technological innovations, such as computing, in local governments.

2. The federal government was first and has remained the most extensively automated level of American government. However, computing has broadly penetrated both state and local governments. A 1976 survey of 49 states shows that they are directly served by at least 603 separate computer systems (NASIS, 1977). At the local level, more than 90% of the cities over 50,000 population and counties over 100,000 population now utilize computers in their operations (Matthews et al., 1976; Kraemer, Dutton, and Matthews, 1975).

3. The power shift hypothesis has attained credibility by virtue of multiple predictions (Kraemer and King, 1976; Crecine and Brunner, 1972; Oettinger, 1971; Etzioni, 1970; Whisler, 1970a, 1970b; Downs, 1967; Leavitt and Whisler, 1958) and empirical research (Dutton and Kraemer, 1977; Hoffman, 1977, 1975, 1973; Laudon, 1974).

4. Who controls technology within public organizations has been shown to affect the adoption, development, and orientation of the technology (Danziger and Dutton, 1977; Dutton and Kraemer, 1977).

5. In most strong-mayor cities these officials tend to be the Director of Finance or the Director of Management and Budget. These officials tend to have professional management backgrounds and tend to be given the chief administrative roles of the mayor. These officials should be distinguished from another group of department heads whose management role is much more limited and from the mayor's political advisers who often fill one or two department head positions but serve little or no management role.

6. While both Danziger (1977) and Downs (1967) broadly suggest that technically educated officials are more likely to control high technology, they do not specifically deal with the planner analysts on whom we focus.

7. Studies of computing in organizations by Dutton and Kraemer (1977). Hoffman (1977, 1975, 1973), and Laudon (1974) point out the overriding influence of an organization on how a technology is used.

8. The use of computing to send utility bills has no obvious power implications for relations among managers, planners, and elected officials. However, it has very problematic and subtle implications for the relative control relationships between government and the general public.

9. Surveys of public preference have been used for determining which projects would be supportable through bond elections.

10. This sampling procedure is described in detail in Kraemer, Danziger, Dutton, Mood, and Kling (1975).

11. In mayor-council cities there was often an official who served the role of manager such as the Director of Management and Budget. Also, many cities have no mayors or council staffs.

12. The self reports point even more clearly than the researcher's ratings to the greater similarities than differences in the use of computing by public officials. The mean level of computer use for *planning purposes* was 42, 44, 41, and 52 for managers, mayors, council, and planners, respectively. Planning uses included the identification of city problems, the identification of solutions to city problems, and the identification of changing city conditions. The mean level of computer use for *management purposes* was 46, 44, 39, and 30 for managers, mayors, council, and planners, respectively. Management uses included budget making, daily expenditure decisions, salary negotiations, determining the real costs of programs, controlling staff, setting realistic goals for subordinates, allocating manpower, monitoring subordinates and determining the efficiency of operating units.

13. These data are based upon open-ended responses in which public officials *mentioned* the use of data banks in ways conforming to our categories of administrative reporting, planning analysis, and political uses. Planners mentioned administrative uses in 90% of the cities, planning uses in 90%, and political uses in 22%. Managers mentioned administrative uses in 63%, planning uses in 47%, and political uses in 23%. Elected officials mentioned administrative uses in 40%, planning uses in 54%, and political uses in 47%.

14. The nature of our sample and observations limits the generality of our findings to American cities. However, the consistency between the findings of other studies and the reinforcement politics hypothesis adds credibility to this hypothesis as a description of the nature of power shifts beyond the local government level (Dutton and Kraemer, 1978; Hoffman, 1977; Laudon, 1974; Westin, 1972a, 1972b).

For example, Westin's (1972a, 1972b) case studies of computing in federal, state, and local agencies indicate that "computers have been a factor in consolidating rather than in redistributing governmental power" (1972b: 21). Westin also concludes that there is not "the slightest sign of a displacement of the traditional elites of top and middle management in government by information specialists" (1972b: 21). This is supported by Hoffman's (1977) study of computing in the Soviet Union which examines the classic case for those who forecast the rise of a technocratic elite with the emergence of modern information processing technologies. Hoffman concludes that:

> native and imported information technology is not likely to alter the fundamental characteristics of the Soviet political system and the central values of the national Communist party leaders. Rather, computerized information systems are among the important new means to pursue traditional values and goals [1977: 429].

Also, a comparison of computer-based information systems in the United States and Western Europe illustrates how computing tends to reinforce existing structures. Computer-based systems serving local governments in the United States are relatively fragmented and decentralized whereas those in Germany and Scandinavia are relatively integrated and centralized, each reflecting their political and cultural setting (Kenneth and Maestre, 1974; Lenk, 1973).

REFERENCES

BANFIELD, E. C. and J. Q. WILSON (1966) City Politics. New York: Vintage.

BELL, D. (1973) The Coming of Post-Industrial Society. New York: Basic Books.

CHARTRAND, R. (1967) "The role of automatic data processing in politics." Washington, DC: Science Policy Research Division, Legislative Reference Service, Library of Congress.

CRECINE, J. P. and R. D. BRUNNER (1972) "Government and politics: A fragmented society, hard to govern democratically—from another vantage point." In The Conference Board Information Technology. New York: The Conference Board.

CYERT, R. and J. G. MARCH (1963) A Behavioral Theory of the Firm. Englewood Cliffs, NJ: Prentice-Hall.

DANZIGER, J. N. (1977) "The skill bureaucracy and intra-organizational control." WP-77-36. Irvine, CA: Public Policy Research Organization.

——— and W. H. DUTTON (1977) "Technological innovation in local government." Policy and Politics 6: 27-49.

DOWNS, A. (1967) "A realistic look at the final payoffs from urban data systems." Public Administration Review 27: 204-210.

DUTTON, W. H. and K. L. KRAEMER (1978) "Management utilization of computers in American local governments." Communications of the ACM 21: 206-218.

——— (1977) "Technology and urban management." Administration and Society 9: 305-340.

ELLUL, J. (1964) The Technological Society. New York: Vintage.

GHERE, R. K. (1978) "Municipal data processing systems and shifting organizational power: The case of the computer technician." Unpublished manuscript.

HOFFMAN, E. P. (1977) "Technology, values and political power in the Soviet Union." In F. J. Fleron (ed.) Technology and Communist Culture. New York: Praeger.

——— (1975) "Soviets information processing." Soviet Union (II): 22-49.

——— (1973) "Soviet metapolicy: Information processing in the Soviet Union." Administration and Society 5: 200-232.

KENNETH, P. and C. MAESTRE (1974) Information Technology in Local Government. Paris: OECD.

KLING, R. (1974) "Computers and social power." Computers and Society 5: 6-11.

KRAEMER, K. L., J. N. DANZIGER, W. H. DUTTON, A. MOOD and R. KLING (1975) "A future cities survey research design for policy analysis." Socio-Economic Planning Sciences 10: 199-211.

KRAEMER, K. L., W. H. DUTTON and J. R. MATTHEWS (1975) "Municipal computers: Growth, usage and management." Urban Data Service Report 11: 1-15.

KRAEMER, K. L. and J. L. KING (1976) "Computers, power, and urban management." Professional Papers in Administration and Policy Studies (Vol. 3). Beverly Hills, CA: Sage.

LAUDON, K. C. (1974) Computers and Bureaucratic Reform. New York: John Wiley.

LEAVITT, H. J. and T. L. WHISLER (1958) "Management in the 1980's." Harvard Business Review 36: 41-48.

LENK, K. (1973) Automated Information Management in Public Administration. Paris: OECD.

MATTHEWS, J. R., W. H. DUTTON and K. L. KRAEMER (1976) "County computers: Growth, usage and management." In ICMA (ed.) The County Year Book. Washington, DC: International City Management Association.

NASIS (1977) Information Systems Technology in State Government. Lexington, KY: Author.

OETTINGER, A. G. (1971) "Communications in the national decision making process." In M. Greenberger (ed.) Computers, Communications and the Public Interest. Baltimore: Johns Hopkins Univ. Press.

PETTIGREW, A. (1975) "Towards a political theory of organizational intervention." Human Relations 28: 191-208.

——— (1973) The Politics of Organizational Decision Making. London: Tavistock.

POOL, I., R. P. ABELSON and S. L. POPKIN (1964) Candidates, Issues, and Strategies. Cambridge, MA: MIT Press.

WESTIN, A. (1972a) Data Banks in a Free Society. New York: Quadrangle.

——— (1972b) Information Technology and Public Decision Making, abstract in Harvard University Program on Technology and Society, 1964-1972: A Final Review. Cambridge, MA: Harvard Univ. Press.

WHISLER, T. L. (1970a) The Impact of the Computer on Organizations. New York: Praeger.

——— (1970b) "The impact of information technology on organizational control." In C. A. Meyers (ed.) The Impact of Computers on Management. Cambridge, MA: MIT Press.

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